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Office of Telecommunications

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Consultative Document

Issued by the Director General of Telecommunications

Numbering: Choices for the Future

1 INTRODUCTION

1.1 The purpose of this Consultative Document is to invite public comment on a range of issues concerning future numbering arrangements for telecommunication services in the UK, following the National Code Change (NCC) in April 1995.

1.2 In July 1992, the then Director General of Telecommunications, Bill Wigglesworth, made a statement announcing the postponement of the NCC until Easter 1995. That statement, *Telephone Numbering: the National Code Change*, also described how the NCC was to be implemented, giving details of the codes that were to change in 1995. The main changes taking place at NCC are:

- the addition of a '1' to all fixed-network area codes after the trunk dialling prefix '0';
- a change of code in five major cities introducing seven-digit subscriber numbers; and
- a change in the international dialling prefix from '010' to '00'.

1.3 The codes that will ***not*** change at NCC are the existing codes for 'non-geographic' services, ie:

- freephone services;
- premium rate services;
- services where national calls are charged at local call rate ('local rate');
- mobile (cellular and PCN) services;
- certain paging services;

and any new codes which may be allocated to such services prior to Easter 1995.

1.4 Copies of the statement may be obtained from OFTEL's Library (tel: 071-634 8764).

1.5 With the new number ranges that will be created by the NCC the UK has the opportunity to develop a numbering scheme for the 21st century. We need to plan wisely for the telecommunications services currently available or which are under development, but we also need to make provision for technological development and new services which are, as yet, no more than a gleam in the eye. This means creating a numbering structure which is flexible and which can evolve in response to competitive market forces and the wishes of the customer.

1.6 It is also necessary to be aware of international developments in terms both of the European Commission's wish to create numbering space for use by pan-European services and of the evolution of numbering plans in other countries, where it may be appropriate to consider a degree of commonality in the number ranges allocated to particular service types.

1.7 Annex A looks at how the numbering authorities in Japan, North America and Australia are using their numbering plans to help identify the services provided. In each of these countries, the telecommunications market is becoming increasingly competitive, and it is interesting to note how dissimilar the three numbering plans are.

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Development of a new numbering scheme

1.8 Against the background of a rapidly growing and changing telecoms market, it would be wrong to be too fully prescriptive about the details of the new scheme. However, there are certain key aspects which need to be determined at an early stage - aspects which were still under consideration at the time of Mr Wigglesworth's statement. Of these, the most important are:

- the future structure and allocation of new codes for non-geographic services after April 1995;
- portability (ie the ability to keep a number if a subscriber decides to obtain telephony services from a different local operator);
- future arrangements for access codes (short codes, currently of 3-digits, enabling the user to access particular special services, eg '192' - directory enquiries);
- the introduction of personal numbering services; and
- possible new number ranges for fixed telephony services additional to the newly defined '01' range.

1.9 This Consultative Document sets out some proposals on these aspects and invites public comment. OFTEL has received advice from the Telecommunications Numbering and Addressing Board and from a number of companies and organisations actively involved in telecoms. OFTEL has also considered developments in the domestic and international markets. The interests of those whom we have consulted do not necessarily coincide. However, the details of the new numbering scheme cannot be debated indefinitely, given the need to plan ahead and to modify equipment and software appropriately. OFTEL has, therefore, set out clearly in this document its proposed way forward, although that does not mean that the proposals cannot be modified should there be good reasons for proceeding in different ways. It should be stressed that the proposals are primarily concerned with the evolution of the UK numbering system in the years beyond 1995. **THEY DO NOT INVOLVE ANY MODIFICATION OF THE ARRANGEMENTS ALREADY ANNOUNCED UP TO AND INCLUDING THE NATIONAL CODE CHANGE ITSELF.**

Information in numbers

1.10 A telephone number can give a limited amount of information. The present geographic system uses the full number to signify the location of the exchange to which the customer is connected and hence the approximate location of that customer; and because the charging system is based on distance, it also gives the basis for working out the cost of the call. Other numbers, such as 0800 XXXXXX and 0500 XXXXXX, only give charging information and contain no geographical significance at all.

1.11 Current numbers also contain network information, and allow the network on which the call originates a very simple means of knowing which network the destination telephone is connected to. With 0500 XXXXXX the originating network knows that this is a destination on the Mercury network, even if it cannot tell where that telephone is located because the number contains no geographical information (just charging information).

1.12 Other numbers in the exisiting scheme have other sorts of information embedded in them. The other major classification of numbers is that for premium rate services where there is both charging information and type of service information (eg the split between 0891 XXXXXX - family services - and 0898 XXXXXX - adult services).

1.13 However, the amount of useful information that can be embedded in numbers is very limited and, perhaps more importantly, some kinds of information are, at least at present, mutually exclusive. If, for example, some numbers are going to signify location, the same numbers cannot also be portable between locations. If numbers are used as a basis of simple routing instructions it makes it more difficult to make these numbers portable between networks, or even within networks. In addition, how much useful information the number contains will also depend on how easy it is for people to recognise the information. The more digits that have to be looked at before useful information can be extracted, the less likely it is that the information is going to be generally useful. One of OFTEL's objectives in these proposals is to make sure that the maximum amount of useful information is able to be embedded in the numbers.

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Administration of numbering

1.14 The Director General of Telecommunications will be the authority responsible for taking decisions on the matters discussed in this document, after appropriate consultation with operators and other interested parties. He will do so within the framework of new arrangements for the adminstration of numbering which are currently being introduced.

1.15 Historically this task has been carried out by British Telecom (now BT), which took over the national numbering scheme developed by the Post Office. Subsequently, all-figure dialling was introduced. Under the new arrangements (which involved modifications to the numbering conditions of the PTO licences) the Director General has power to determine a Specified Numbering Scheme ('the Scheme'), in accordance with a set of principles and rules known as Numbering Conventions. Once the Scheme has been determined the Director General will make allocations of numbering capacity to licence holders from within the resources of the Scheme, and will decide on and allocate new codes. Transfer of responsibility of numbering administration from BT to OFTEL is expected to be completed during 1994.

1.16 Each licensed operator will be expected to prepare a Numbering Plan for the system concerned and collectively those Plans will reflect the UK Numbering Scheme to the extent that it has been developed and implemented at any point in time.

1.17 Draft Numbering Conventions are currently being discussed by the Telecommunications Numbering and Addressing Board (TNAB); after consideration of TNAB's comments, and having regard to the responses to this current consultation, OFTEL intends to issue the Conventions for the formal consultation required by operators' licences. Publication of the Conventions and the Scheme will follow in due course.

1.18 This Consultative Document does not form part of any licence requirement placed on the Director General or on operators in respect of consultations.

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Modifications to equipment

1.19 With the opening up of the UK telecoms market, there are important messages for the manufacturers of telephony equipment, who need to design their products so that they can be reprogrammed quickly, simply and cheaply as the numbering scheme evolves; and for users and network operators who must use their right of choice in a competitive market to select equipment which can accommodate number changes and additions.

1.20 OFTEL is well aware of the changes that follow from the decision to implement the National Code Change in 1995. Public network operators are having to adapt their switching systems and support systems; customer premises equipment suppliers have to develop terminal equipment to maintain functionality where the digits dialled carry particular significance, such as for charging and least cost routing; and users have to become aware of the code change so that they can dial correctly, or programme their apparatus to do so. However, OFTEL is confident that the National Code Change in 1995 will make available sufficient extra capacity which, if managed properly, means that **IT WILL NOT BE NECESSARY TO IMPOSE ANY NATIONAL CODE CHANGES IN THE UK IN THE FORESEEABLE FUTURE.**

1.21 This is contrary to the view that has been expressed by some members of the telecoms industry, who favoured modifying and improving the efficiency of the existing numbering scheme as and when the need arose. Code changes would have been necessary, but fragmented over an indefinite period of time, without providing sufficient capacity for a coherent National Numbering Scheme.

1.22 In order to determine call charges or effect barring of calls to some destinations, terminal equipment examines the first few digits dialled including the prefixes '0' and '010' to identify national and international calls, respectively. The introduction of the digit '1' after the '0' and before existing area codes, requires terminal equipment to examine one more digit than was necessary prior to the NCC. It is this extra digit that needs to be accommodated in terminal equipment, if functionality is to be maintained, but once introduced, it should not be necessary in the future to impose such a general increase in the number of

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digits that have to be examined by terminal equipment. In fact, the move from '010' to '00' means that international calls will be identifiable by examination of only two digits, and it will be relatively easy to examine the '01' of national calls after the NCC, to distinguish between calls to fixed terminations (and therefore having distance dependent charging) and calls to all other services.

Consultation period

1.23 Views on the issues discussed in this document should be sent to Alan Pridmore, OFTEL, 50 Ludgate Hill, London EC4M 7JJ and should reach OFTEL by 16 August 1993. Respondents should be aware that replies will be treated as if in the public domain.

Index of Sections

1.24 The following is a complete list of the topics considered in this paper and the sections dealing with them:

2 Numbers and branding
3 Principles
4 Number allocations
5 Portability
6 Geographic numbering ranges
7 Future of numbering ranges for paging services
8 Personal numbering
9 Existing non-geographic services
  mobile; specially tariffed services
10 Other uses
11 Access codes
12 Summary

1.25 A summary of OFTEL's recommendations for the structure of the Scheme is provided in diagrammatic form at Annex B.

Terminology

1.26 References to the length of numbers in the text do not include the national dialling prefix' 0', ie:

(0)222 248700 is a nine-digit number

which will become a ten-digit number

(0)1222 248700

when the National Code Change takes place in 1995.

1.27 The structure of numbers, and the position of digits within numbers, is frequently represented by letters in the text as:

(for 9-digit numbers)	0ABC DEFGHJ
eg	0222 248700
(for 10-digit numbers)	0SABC DEFGHJ
eg	01222 248700

'X' is also used in the general case to represent any number (0-9)

1.28 We have termed the extra digit '1' added at NCC to geographic numbers the 'S' or structure digit and, in considering the move to 10-digit numbering for the ranges '02' to '09', the extra digits added at beginning of the number are therefore referred to as *S-digit '2'* etc.

1.29 Where the term 'operator' alone is used in the text, this refers to Public Telecommunications Operators and other network operators who use numbers from the national scheme.

2 NUMBERS AND BRANDING

2.1 In the 1991 White Paper *Competition and Choice: Telecommunications Policy for the 1990s* the then Director General indicated his view that no operator should impede competition by exercising proprietorial rights over numbers.

2.2 The concept of numbers as a national resource has since developed even more clearly - both in OFTEL and generally in the industry, particularly as expressed through the Telecommunications Numbering and Addressing Board. As discussed in the introduction, OFTEL will manage this resource and make allocations to operators who will then make individual allocations to their customers.

2.3 In aiming to promote the full development of competition, OFTEL considers it to be of paramount importance that the concept of numbering as a national resource should also ensure that the customer should not be 'locked-in' to particular operators. The customer should be able to seek a similar service from another operator without the costs and disruption of a number change.

2.4 In considering options for the development of the numbering scheme in this document OFTEL has therefore aimed to make recommendations that will:

- avoid the branding by operators of their services by means of their numbers (although it is recognised that this will continue to be required for some services for some time to enable effective routing);
- not inhibit the introduction of portability of numbers for similar services or the introduction of personal numbering;
- encourage the development of services that will help the customer to avoid being tied to one particular operator.

2.5 These issues are explored further in the sections which follow.

3 PRINCIPLES

3.1 In evaluating the options set out in this document, OFTEL has identified some basic principles. These principles are set out below and form OFTEL's view on the basis on which the UK numbering scheme should develop.

(i) The introduction of 10-digit numbering for geographic numbers with the National Code Change potentially creates a ten-fold increase in capacity. The Scheme should be developed in a way that avoids waste of the available capacity.

(ii) The Scheme should be developed in a way that ensures its longevity. It should leave sufficient ranges free to allow for technological developments and for further expansion of the number of digits should this ultimately be necessary.

(iii) A clear structure should exist to allow operators, manufacturers and users to plan ahead with confidence.

(iv) The costs of number changes can be high. There is therefore a need for the Scheme to be developed in a way that minimises disruption to users and operators. The Scheme should be evolutionary not revolutionary.

(v) The portability of numbers between operators and service providers is seen by OFTEL as an essential goal in ensuring effective competition. The development of the Scheme should therefore not inhibit the portability of numbers.

(vi) The provision of information about location and service type (and therefore to some extent tariff type) through the numbering scheme is seen as desirable by users. The results of an NOP survey of user attitudes carried out for OFTEL are given in Annex C. While it is recognised that the development of the Intelligent Network is likely to lead to alternative means of providing geographic and tariffing information, the requirement for significance to be conveyed by the number will remain in the short to medium term - and possibly indefinitely for some users. The scheme should therefore be developed in a manner which allows for the provision of such information.

(vii) The numbering scheme should allow innovative use of the numbering range. (For example, the introduction of calling line identification means that it will be possible for the receiver of calls to use the information contained in the number of the person making the call. This facility opens up the possibility of completely new services based on the caller's number, such as call-barring of incoming calls, if the numbering scheme is flexible enough to embed significant information into these numbers.)

4 NUMBER ALLOCATIONS

4.1 The OFTEL statement issued in July 1992 on the National Code Change indicated that existing non-geographic services should be able to continue with their present codes and (generally 9-digit) subscriber numbers for as long after the National Code Change as operators or customers wished.

4.2 We need to consider how to link this decision - based on the principle of minimising disruption to users and operators - to the development of a coherent overall numbering structure.

Corresponding S-digit allocations

4.3 One method would be to make available to the operators concerned corresponding allocations of codes in an appropriate S-digit range at a suitable interval after the NCC. Thus, a mobile operator with a current allocation '0ABC' could retain '0ABC' and also have the allocation '0SABC'. For example, in the section on cellular services below, we consider the option of allocating Vodafone '03831' corresponding with its existing nine-digit range '0831'. Such an approach would assist the evolutionary development of the scheme.

Additional later digit

4.4 A second method would be to allow the operators to increase the length of the numbers they were using by the insertion of an extra digit at some point after the 0ABC code, *provided that A was equal to the appropriate S-digit for that range*, eg

0945	123456	could become	09451	234567
0ABC	DEFGHJ		0SABC	DEFGHJ

4.5 The position of the extra digit chosen by each operator would depend on the numbering structure and number allocation arrangements adopted in its numbering plans. These options are explored further in section 9 on cellular mobile and PCN respectively.

New code allocations

4.6 We also need to decide how to treat applications for new code allocations from operators of existing non-geographic services currently with 9-digit allocations, after the opening up of S-digits '2' to '9'. The choice is:

either to leave operators the option of remaining outside the S-digit structure, ie allocate ABC codes in a 9-digit structure;

or to require all new allocations to be within the selected S-digit range.

4.7 The former option would allow operators to maintain or develop their own service identity ('operator branding'), possibly with allocations of new codes adjacent to existing codes. However this would be clearly against some of the basic principles set out earlier in this document; it would inhibit the development of portability and of a clear numbering structure. It would also be likely to work against effective conveyance of service and tariffing information in the number.

4.8 The latter option would be more likely to meet these principles.

Number length

4.9 Closely allied to this is the question of whether all new code allocations to operators after the introduction of S-digits should be for use in ten-digit numbering ranges. Within the S-digit '1' range, number length will initially be 8, 9 and 10 digits but BT and Mercury have indicated their intention to continue to move progressively to a uniform number length of 10 digits - a move which OFTEL supports. For other S-digit ranges, the National Code Change will - after an appropriate period for numbers to be sterilised - allow the utilisation of 10-digit numbers for new allocations.

4.10 With the significant increase in capacity created by the NCC, it may be argued that there should be some scope allowed for operators to develop, within the framework of their numbering plans, their own distinctive number structure using varying number lengths. However, this would be against the principle of encouraging the optimum use of available capacity. In addition, there is some evidence that users favour the consistency of uniform number lengths.

New allocations of subscriber numbers within existing codes

4.11 The above paragraphs deal with the allocation of ***codes*** to operators by the Numbering Administrator. In the case of operators who have existing code allocations for non-geographic services where the A-digit is not the same as the proposed S-digit and once corresponding code allocations in the S-digit range have been made (eg 0831 and 03831 for Vodafone, as discussed in section 9 below), the options are:

either for the operators to continue to make new allocations to subscribers in the A-digit range and to make use of the S-digit range when they wished or when capacity ran out in the existing range;

or for operators to make new allocations only in the S-digit range (there could be certain exceptions to this to meet particular customers' needs).

4.12 The former option would clearly provide the greater flexibility to operators while the latter would be more likely to hasten the development of a coherent numbering structure.

4.13 To encourage the development of a coherent numbering structure and to make the most effective use of numbering capacity, while seeking to avoid imposing unwanted number changes on operators and their customers, OFTEL proposes that:

- **(i) customers of operators should be able to continue with existing 9-digit numbers already allocated outside the S-digit '1' range;**
- **(ii) all new code allocations to operators after the introduction of the S-digit ranges should be of 10-digit numbers and within the S-digit range appropriate to that service;**
- **(iii) operators using 9-digit numbers outside the S-digit '1' range should be able to expand to 10-digits through allocations of corresponding codes in the S-digit ranges (ie '0SAB' to correspond with '0ABC') or by the addition of an extra digit in the latter part of the number; and**
- **(iv) following the opening up of corresponding S-digit ranges, operators should generally make new allocations to subscribers only in those ranges.**

4.14 OFTEL would welcome views on these points.

5 PORTABILITY

5.1 In the 1991 White Paper *Competition and Choice: Telecommunications Policy for the 1990s* the then Director General took the view that transferability of numbers between operators is desirable in ensuring effective network competition and that the planning of a National Numbering Scheme should allow for numbers to be portable between operators and possibly geographical locations. However, he recognised that a decision on portability should balance the benefits of the introduction of portable numbering against the likely costs.

5.2 The OFTEL exercise to establish the costs and benefits of number portability (local number portability) for telephony services delivered to a fixed address with an exchange line is underway. This will in practice relate to inter-operator portability between fixed services in the S-digit '1' range.

5.3 OFTEL's view of the importance of portability in promoting competition, however, also applies to non-geographic services. It is therefore important that any decisions made at this time on number structure and allocation should not make more difficult any future decision to require the introduction of more general portability.

5.4 Of particular concern are the effects on portability of the use of databases, especially for freephone and personal numbering services. If each operator holds a database which has to be interrogated to determine the routing of the call, then either all the databases have to contain identical information - technically and administratively a very difficult task - or some level of digit discrimination has to be used to route calls to a particular operator's database. The latter effectively gives proprietorial ownership of numbers to the operator of the database. Whilst this would rule out portability of numbers between database operators, it would not necessarily preclude the customer porting his number for the provision of other telecommunications services.

5.5 The introduction of single databases for each service type would involve a significant centralisation of certain aspects of the network at a time when greater diversification is being encouraged. If this degree of centralisation is to be avoided without the risks of excessive fragmentation of databases, it may be worthwhile considering a simple hierarchy of databases, in which parochial ones operating at the lowest system levels would have changeable pointers towards a small number of collective databases which would provide number translation on a competitive basis. These in turn would obtain allocation of numbers from a central registry of, for example, personal numbers.

5.6 OFTEL's study of the costs and benefits of local number portability is underway and will be followed by a period of formal consultation with interested parties. The issues covered are outside the scope of this Consultative Document.

5.7 OFTEL believes that portability of numbers within service types must also be encouraged. Comments are invited on the significance of numbering in achieving this, particularly in respect of services requiring database interrogation, and on the commercial implications.

6 GEOGRAPHIC NUMBERING RANGES

Existing area numbering ranges

6.1 The OFTEL statement issued in July 1992 on the National Code Change confirmed the current geographic structure as the basis for the S-digit '1' range.

6.2 The current structure, based on about 638 small inflexible geographic areas, works against the optimum utilisation of capacity and may not be appropriate for all the new operators and services. However, changing the geographic structure that underlies the S-digit '1' range would result in number changes, costs and disruption for a large number of users. This would be highly undesirable and against OFTEL's stated intention of allowing the numbering structure to develop to accommodate changing customer requirements.

6.3 OFTEL therefore does not propose any significant changes to the existing geographic structure in the S-digit '1' range beyond those outlined in earlier statements.

Proposals for new geographic numbering ranges

6.4 It is likely, however, that a number of operators providing fixed services, whether delivered by conventional or radio-based means, will want to have the freedom to develop their own tariffing arrangements outside the current numbering structure. As a development which will encourage competitive services and prices, OFTEL would support this desire at least in principle.

6.5 In addition, despite the likely increase in the availability of personal numbering services and the possible introduction of inter-operator number portability, it can reasonably be expected that there will continue to be pressure on numbering capacity for geographic services in the S-digit '1' range, at least within certain areas of the structure.

6.6 It would seem sensible therefore to make provision in the longer term for the expansion of the geographic network (PSTN) into another S-digit range and S-digit '2' has been generally suggested for such a development.

6.7 Various proposals for the use of the S-digit '2' range have been made. Some of these are considered below.

(i) Zonal numbering range

6.8 Such a scheme would be based on a new geographic structure and would overlay the existing geographically-based scheme in the S-digit '1' range. It would provide an opportunity to consider the basic principles on which a geographic numbering scheme should be devised.

6.9 It would appear necessary for the scheme to retain some geographic basis since it is generally agreed that there are benefits to customers in conveying a geographic identity in a small set of numbers and since this would allow operators to develop a structured tariffing regime. However, it is desirable to encourage meaningful and effective use of numbers and to do so the scheme would have to consist of geographic areas significantly larger than under the current structure.

6.10 Consideration needs to be given to the number structure for such a zonal scheme. Two options which have been suggested are:

(a) (0)S + A + BCDEXXXX	where the A-digit (0-9) is allocated to up to 10 zones
(b) (0)S + AB + CDEXXXX	where the AB digits (00 to 99) are allocated to more than 10 zones

6.11 The first option would allow significant capacity within each zone (up to 100 million numbers) but would permit only a small number of geographical areas. The second option would offer a more flexible division of geographic areas but could create possible restrictions on growth in heavily populated areas (with a maximum of 10 million numbers in each area).

6.12 It may be preferable to adopt a structure which combines the two options - using A-digit zones for areas (such as South East England or London) where large capacity is required and AB-digit zones for areas (such as Wales) with distinctive geographic identities but with lower capacity requirements.

6.13 The introduction of a zonal structure will have implications for routing and charging, especially with least cost routing equipment, and planning and implementation of such a scheme would have to take careful account of such considerations. There may be a trade-off between the amount of geographic and tariffing information that can be contained in the number.

(ii) A duplicate of the S-digit '1' area range

6.14 Two options are considered below. Both would involve the adoption of the same geographic boundaries as the area range behind S-digit '1'. However under (a) the same numbers would be used while under (b) a different numbering structure could be used.

(a) Using the same numbering structure

6.15 Under this option codes and numbering ranges allocated behind S-digit '2' would provide an identical quality to, and involve the same dialling plan as, the codes and numbering ranges to exist behind S-digit '1'. Thus, London PSTN numbers would expand into '0271' and '0281', Cardiff into '02222'. Such a scheme would allow an effective doubling of capacity and would provide an easily understandable expansion. It should also require less complex modification of switching and least cost routing equipment.

6.16 However the dual allocation might confuse users and, in reproducing the current structure, it would tend to perpetuate all of its disadvantages. Under utilisation of capacity within many code areas would continue. Furthermore it is likely that such a scheme would stifle the growth of competitive services and new tariffing arrangements. Many new and potential operators have already indicated that they are concerned that the adoption of the current structure would restrict their developing new and competitive tariffing arrangements more consistent with modern telecommunications system structure and that they would want to have code allocations outside the current structure.

(b) Using a different numbering structure

6.17 This scheme would allow exhausted codes in the S-digit '1' range to overflow into new codes, while retaining the same geographic area. It differs from (a) in that it would entail a new numbering structure. Thus London '0171' could overflow into '02X' or '02XX' - allowing in the first case 8-digit subscriber numbers and a ten-fold additional capacity and in the second 7-digit numbers and doubling of capacity.

6.18 This would allow more effective utilisation of the new range than the scheme set out under (a) but as with (a) would tend to perpetuate existing tariffing structures by retaining the same boundaries.

(iii) Operator specific plans

6.19 This proposal would allow operators freedom to develop their own numbering plans behind the S-digit. Thus one new national operator might request an allocation of ten 3-digit codes to divide up its network geographically (the capacity of each code would be determined by an assessment of the operator's demand forecasts), while another operator with a more limited franchise might seek an allocation of a single code for the whole of the area served.

6.20 This scheme would have the advantage of allowing the market maximum freedom to develop schemes appropriate to its tarriffing arrangements. However, even though the S-digit range could be opened up progressively, it would lead to a very unstructured arrangement and would be likely to inhibit number portability both of geographic and non-geographic numbers because of the variation in routing and charging arrangements. It would also make it very difficult to ensure that equipment was programmed to route and charge for calls correctly.

6.21 An alternative might be to reserve code space in the zonal scheme discussed above, behind one or two A-digits, for allocations to operators wishing to operate their particular plan outside either national structure, eg '028' and '029' might be earmarked for this purpose with allocations of codes '028XX' and '029XX' to operators.

Dialling arrangements

6.22 The dialling arrangements for a new geographic structure will also need to be considered. Clearly there will be a need for full national number dialling between numbers in the new S-digit structure and those in S-digit '1'. Within the new S-digit ranges it would be possible to have two-tier dialling (ie those within the same zone or area code and with numbers behind the same S-digit could dial each other using only the 'local' numbers).

6.23 However, in the case of the zonal network and duplicate schemes ((i) and (ii) above), the codes envisaged to identify areas might be only 1 or 2 digits long, and it might well be more appropriate to encourage only single tier dialling within and between numbers in the new S-digit ranges.

6.24 OFTEL recognises that issues of fundamental importance are involved in any move away from the existing geographical structure. OFTEL recommends that the concept of a new numbering structure behind S-digit '2' be explored further and would welcome views on the principles that should be applied and the method of implementation of this structure. In particular, comments are invited on:

- **(i) the appropriate geographic structure (if any) to be identified and the corresponding allocation of rs;**
- **(iii) the technical implications (eg routing and charging) of the various options;**
- **(iv) the amount of notice required for the opening up of the range.**

7 PAGING

7.1 When the decision on the National Code Change was made, OFTEL agreed to a request from some members of the radiopaging industry that radiopaging numbers should in general adopt the S-digit '1'. (There are certain exceptions to this; details of these were given in the OFTEL statement on the Code Change.)

7.2 For historical reasons radiopaging services have grown up with a variety of codes and access methods. In some cases subscribers dial a bureau, which may carry a PSTN number or a number in an STD code reserved specifically for paging. Some radiopaging operators were concerned that confusion might arise - relating to the numbers dialled and the charges payable - if numbers for accessing their subscribers which were generally perceived to be PSTN numbers did not move into the new range. In meeting these operators' wishes, paging services which are directly dialled (direct access to the pager rather than via a bureau) are also included behind S-digit '1'.

7.3 In the July statement OFTEL recognised that there may be a need for some rationalisation of radiopaging numbers in the longer term. It would seem appropriate that this is now considered in the context of the other issues dealt with in this document.

7.4 OFTEL therefore proposes that:

- **(i) existing allocations of numbers to mobile paging services adopting S-digit '1' remain in the S-digit '1' range but with the prospect of parallel access using the same ABC code behind S-digit '3';**
- **(ii) new allocations of geographic codes and numbers behind S-digit '1' continue to be made available on request for radiopaging services operating via a bureau service;**
- **(iii) new allocations of codes and numbers for directly dialled paging services be made in the mobile services range - S-digit '3' as proposed.**

Comments are sought on the above proposals.

8 PERSONAL NUMBERING

8.1 Personal numbering is a system of telephony numbering in which numbers are allocated to individuals rather than to the addresses of particular network termination points. Once a person has been allocated a personal number, either for his personal use or as the holder of a particular business position, others may call the person using that number. When a call is originated, the calling party's system recognises the dialled code as being that of a personal number range and proceeds to obtain a translation from that number to a number in another range. The user of the personal number is required to keep updated the database that provides translation so that calls may be delivered to an appropriate network termination point according to the person's whereabouts. Translation could stimulate delivery to a fixed terminal (S-digit '1' range), mobile (S-digit '3' range) or an answering service.

8.2 Personal numbering services are not currently in operation in the UK but are likely to commence shortly and become an area of rapid growth. Although the development of such services may actually help to reduce the rate of growth of demand for 'visible' telephone numbers, such services will demand a large amount of 'invisible' numbers for routing to the various network terminations.

8.3 Because personal numbers need to be processed through a database there is considerable merit in giving such numbers a readily recognisable format through the use of a particular S-digit, possibly combined with defined A- and B-digits. This will enable such numbers to be readily identified by callers and easily processed by all the operators of private and public systems.

8.4 Personal numbering services are developing quickly in the US. The American operator AT&T has launched its own service using '0700' numbers and the Federal Communications Commission (FCC) has subsequently issued a consultative document proposing that the '0500' range be generally used for personal communications services - PCS. (In the US, though, PCS are the equivalent of the mobile PCN services currently being developed in the UK, and thus not identical to the concept of personal numbering outlined above.) It is clear to OFTEL that, whilst individual operators must remain free to offer whatsoever services they are licensed to provide, there is considerable merit in ensuring that a large range of personal numbers is open to use by all operators and, moreover, that customers should be able to retain their personal number when they change from one personal number service provider to another, ie personal numbers must be fully portable. Without such portability there cannot be full competition between the providers of such services, nor can the customer benefit from the concept of a 'telephone number for life'.

8.5 OFTEL recognises that the development of databases still has some way to go before complete portability of personal numbers can be achieved. But this should be the ultimate goal and decisions taken now about the choice of numbers for personal telephony services should have regard to this. We also need to keep in line with international developments. It is not clear at this stage whether '0700' or any other range is likely to be adopted as an international standard for personal numbers, but it is not beyond the realms of possibility to envisage a future in which the international traveller will be able to take his personal number with him. The US has led the way in the development of freephone numbers, and consideration is being given to the adoption of '00800' as the code for international freephone services.

8.6 OFTEL believes that the developments in personal numbering in the US should be studied carefully and that we should consider using S-digit '7' for personal numbering services in the UK. We could start by opening up the '070X' range. This would allow allocations of blocks of one million numbers with differentiation at C-digit level, or, more probably, 100 000 or 10 000 number blocks with differentiation at D- and E-digit level respectively. Initially, allocations of numbers would be made to individual operators. But operators would need to cooperate in the development of databases in order to ensure that the customer could change operator if he wished.

8.7 OFTEL believes that personal numbering services are an important new development in the telephony market and that they must be accommodated within the National Numbering Scheme in a way which:

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(a) permits competition between personal numbering service providers; (b) is within the scope of developments of databases and network architecture; (c) is consistent with international developments and (d) does not have any anti-competitive effects on current operators.

8.8 OFTEL believes that this end can best be achieved by initially dedicating an S-digit - '7' is proposed - to these services and by opening up capacity progressively in the '70X' ranges with personal numbering operator identification, if initially necessary, at the D- or E-digit level but with the aim of moving towards full portability of these numbers as quickly as possible.

8.9 OFTEL would welcome comments on the ideas set out above and other views and proposals on the numbering structure for personal numbering services. The charging regimes for these services are outside the scope of this document.

9 EXISTING NON-GEOGRAPHIC SERVICES AND ALLOCATIONS

9.1 There is a range of common issues which affect the move to 10-digit numbering for existing non-geographic services, for example cellular mobile, Personal Communications Networks (PCN) and specially tariffed services (premium rate, freephone, etc).

9.2 There are for instance two primary factors which should determine the method by which this move should be achieved:

(i) the desirability of minimising disruption to network operators' systems and user services;

(ii) the need to provide a means by which the service type (and therefore, in broad terms, tariff type) can be identified.

9.3 Given the similarity - at least from the consumer's view - between groups of these services, their tariffs and the number ranges currently allocated, the three sections that follow must to some extent be considered as a whole.

Mobile services

(i) Cellular

9.4 Codes currently allocated to cellular mobile services are:

374	Vodafone	831	Vodafone
385	Vodafone	836	Vodafone
802	Cellnet	850	Cellnet
		860	Cellnet

9.5 These codes will not change at National Code Change.

9.6 Given these allocations, the most appropriate method for moving to 10-digit numbering in the longer term would involve the adoption of S-digit '3' or '8'. The methods of adopting either route are considered below, together with the advantages and disadvantages.

Option A: S-digit '3'

9.7 Following the methods discussed in the Number Allocations section above, Vodafone could, in the longer term, move to 10-digit numbering for new allocations

either by inserting S-digit '3' in front of the existing codes, '374' and '385' becoming '3374' and '3385';

or by expanding the national significant numbers by the insertion of an extra digit, eg '374X' and '385X'.

9.8 Vodafone's and Cellnet's existing 9-digit numbers in the '08' range could have corresponding 10-digit allocations in the '038' range, eg Cellnet would have '03860 operating in parallel with '0860'. In all cases, the 9-digit numbers could continue to operate in parallel, although OFTEL would encourage migration to 10-digit numbering behind S-digit '3'.

9.9 Given that the majority of cellular numbers are currently in the '08' range, this would involve the evolutionary move of most such numbers to the S-digit '3' range. It would however allow a clearly identifiable numbering range for mobile terminals.

Option B: S-digit '8'

9.10 The move to 10-digit numbering within the S-digit '8' range would permit cellular mobile numbers currently in the '08X' range to expand through the adoption of an extra digit after the C-digit. Effectively the existing '0ABC' code becomes the '0SAB' code. Thus Vodafone and Cellnet could retain '0836' and '0860' as initial digits and could expand capacity for future allocations to customers within those codes by adding digits later in the number as and when unambiguous number space becomes available.

9.11 In the case of numbers currently in the '03X' range, Vodafone could be allocated '08385' and '08374' which would operate in parallel with their existing codes.

9.12 However, the recommendation is also made below for the placing of specially tariffed services behind S-digit '8'. If this recommendation and Option B were adopted, there would appear to be a significant risk of user confusion. It would be very difficult for clearly defined areas of the range to be reserved or 'isolated' for cellular services.

(ii) Personal Communications Networks (PCN)

9.13 Current 9-digit allocations to PCN services are:

956	958	Mercury One-2-One
973	976	Hutchison Microtel

9.14 PCN operators have expressed a wish to expand to 10 digits by adding an extra digit at the end of their numbers. This would have the advantage for them of maintaining distinctive allocations behind S-digit '9' and of minimising the disruption to customers. PCN operators argue that the service which they provide will be different and at lower cost than existing cellular mobile services, and that a different number identity is therefore appropriate.

9.15 However this would mean that the S-digit '9' range is opened up to provide, at least initially, a relatively small amount of numbers. We also need to bear in mind that other mobile telephony services - GSM, micro-cellular networks - are being developed and their operators might also seek a separate S-digit identity. The consumer, however, would not necessarily agree. It may be more appropriate therefore to consider the merits of placing - by the evolutionary means considered for other services - all mobile services together.

9.16 Given the options for cellular services considered above, allocations for PCN services would therefore be either in the S-digit range '3' or '8'. 10-digit number allocations corresponding to PCN's current 9-digit '09' numbers could be made in the S-digit '039X' or '089X' ranges. The PCN operators could continue with their 9-digit '09' numbers but would be encouraged to use '039X' or '089X' numbers for new allocations. However, an allocation for PCN in the '089X' range might be considered to be too close to existing 9-digit allocations for premium-rate services and this would appear to add weight to the arguments favouring the use of S-digit '3' for mobile services.

9.17 Given the user perception that mobile services have definitive and characteristic features associated with the use of radio and delivery to a portable terminal, OFTEL's preference is to facilitate their move to 10-digit numbers in a Mobile (Terminal) Number Range behind a single S-digit. To give mobile services a clear identity, separate from specially tariffed services, the use of S-digit '3' is recommended.

9.18 OFTEL would welcome comments on the above proposals.

Specially tariffed services: Premium rate and national calls charged at local rate

9.19 Current allocations are:

Premium rate services:	336 338 640 660 8364 839 881 891 898
National calls charged at local rate:	345 645

9.20 In view of the presence at the moment of most premium-rate services in the A-digit '8' range and of developments internationally, it would appear appropriate for these types of services, and perhaps other specially tariffed services, to be placed behind S-digit '8'.

9.21 In the development of the structure of the S-digit '8' range, account needs to be taken of two main factors. First, the number allocation should be such as to give a clear indication of the nature of the service, and associated tariff. Second, allocations should take account of existing non-geographic services using the A-digit '8' ranges - 0802, 0831, 0836, 0850 and 0860 - used by Cellnet and Vodafone, as well the existing freephone and premium-rate services.

9.22 Within the criteria above, there are a number of options for code allocation including:

(i) Using the '08X' range, eg initial allocations

0834X	'local rate'	0864X	'local rate'
088X	premium rate	089X	premium rate

9.23 Such allocations would allow the evolutionary development of the structure, eg BT's local rate could be available on '0345' and '0834 5', Mercury's on '0645' and '0864 5'. However, such a scheme would use a broad spread of the available range and also might cause user confusion in view of the existing non-geographic codes within A-digit '8'. There would be some similarity with existing 9-digit cellular numbers ('0831', '0836' and '0860') but, if Option A proposed above for cellular services were adopted, the situation would be limited given the evolutionary move envisaged to S-digit '3'. This option would also have the advantage of retaining the numbering identity of several premium rate services - services which the NOP user survey shows are recognised by number and where awareness is important given the level of charges.

(ii) Using the '080X' range, eg allocations

0801	unallocated (possible freephone expansion)
0803 & 0806	national calls charged at local rate
0808 & 0809	premium rate

9.24 Such an allocation would provide for a clearer structure, would not conflict with existing numbers and would leave much of the S-digit range for future expansion.

9.25 However, it would not provide for such an easy absorption from existing specially tariffed structures. There might also be an increased chance of user confusion given the similarity of the codes. This would be undesirable given the very sensitive issue of charge rates for the services in question.

9.26 For these reasons, OFTEL favours option (i) but would welcome comments on the introduction of 10-digit numbering for premium-rate and local-rate services.

Specially tariffed services: No-charge calls ('Freephone' services)

9.27 There is considerable demand for distinctive numbers from companies and service providers who are willing to pay for the calls made to them. Calls are free to the caller for what is often called a 'freephone' service. Two codes are currently in use for these services:

0500	Mercury	0800	BT

9.28 A manual service - where the caller is connected by the operator - is also available. This uses numbers that are not regarded as part of the national numbering scheme, but this service is being superseded by the automatic services and is therefore omitted from the following discussion.

9.29 Whatever route is chosen for the numbering of future freephone services, it should take account of the possible need for expansion in the long term of the freephone range - the rapid growth of such services in the US suggests that it would be prudent to ensure significant numbering capacity for these services.

9.30 OFTEL believes that freephone ranges should be opened up to all network operators and, to encourage the development of full competition, OFTEL would wish to seek the portability of freephone numbers within these ranges between operators. As discussed in section 5 above, it is recognised that this is likely to be linked to the development of the appropriate databases. Decisions made at this stage on the numbering scheme should therefore be consistent with this goal.

Moving to portability and 10-digit numbering: 0800

9.31 OFTEL believes that the '0800' code range - currently offered only by BT as its Freephone service - should be opened up to other network operators to provide freephone services.

9.32 It is recognised that, in order to provide customers with commercially attractive numbers, BT has made allocations of various 10-digit numbers across the '0800' code range. This means that the allocation of blocks of '0800' numbers to other operators will be difficult to effect and may require at least parts of the range to be 'cleared' to enable coherent allocations in future. There are also technical issues associated with routing and interconnection which need to be considered in opening up services for a code range which is currently provided by only one operator.

9.33 Two options for the numbering of '0800' freephone services are considered below, relating to the migration from 9-digit to 10-digit numbering and the opening up of the range to competition.

Option A: Extending the code

9.34 Existing BT freephone subscribers could move to a new code range behind the S-digit '8' ('08800' has been suggested) so that '0800' could be opened up as a new 10-digit range. New allocations by BT to its customers could be made from the '08800' range. This would have the advantage of allowing the '0800' range to be cleared for new allocations to all operators.

9.35 The inconvenience to existing freephone customers could be minimised by:

- a period of parallel running of the existing 9-digit and new 10-digit ranges (when either number would be accepted, thus encouraging a gentle migration to the new ranges);
- making identical allocations for existing 9-digit '0800' numbers in the new '08800' range; and
- having changed number announcements and call forwarding arrangements following the period of parallel-running.

Option B: Extending '0800' numbers

9.36 There are three related possibilities for this option - all involving a move from six-digit to seven-digit subscriber numbers following the '0800' code.

9.37 *(i)* '0800' subscribers could elect to change numbers in a way best suited to maintaining as far as possible the memorability of the number. Subject to availability, old and new numbers could co-exist during a period of parallel running.

9.38 *(ii)* The extra digit could be added consistently to the end of existing 9-digit numbers. Migration would be eased by allowing existing freephone subscribers to have an option on the corresponding block of ten numbers, subject to appropriate terms and conditions. The extra digit would be 'silent' until taken into use for routing by the network or passed to the subscriber (DDI) for discrimination between services. For example, the freephone number '0800 123456' would become '0800 123456X' where 'X' represents the digits 0-9.

9.39 Both (i) and (ii) are intended to reduce customer disruption by reinforcing existing allocations, but would mean that the '0800' range remained 'spoilt' with no scope for the allocation of large blocks of numbers to different operators. However, in that both arrangements would from the outset be likely to require the examination of all the digits in the number, they should encourage techniques which would facilitate the portability of numbers between operators.

9.40 *(iii)* An extra digit could be inserted after '0800' (ie '0800X'). Parallel running would allow calls to 9-digit numbers to be delivered during a transitional period. If 'X' were given a value of '1' for existing BT allocations, other values of 'X' could be allocated to other operators.

9.41 This would have the merit of paving the way to clear a large part of the '0800' range for eventual allocation to other operators and, while there might be some disruption to users, this could be limited given appropriate transitional arrangements.

9.42 As and when '0800X' is introduced there may be merit in identifying operators by C- or D-digits in order to ensure calls are routed effectively. However, in dividing up the range in this way, it is recognised that arrangements might be put in place which ultimately might make the introduction of portability more difficult.

9.43 All the above options might require special commercial terms to allow ongoing use of a particularly attractive number in the '0SAB' range of '0800'.

9.44 OFTEL is inclined towards Option B(ii) above but would welcome comments and proposals on the technical means and numbering arrangements by which the opening up of '0800' might be achieved.

Moving to portability and 10-digit numbering: 0500

9.45 The code '0500' is currently used with 6-digit numbers for the Freecall service run by Mercury.

9.46 As indicated earlier, OFTEL does not wish to impose any code changes other than the NCC in 1995, so the '0500' code with 6-digit numbers will continue to be available after the NCC.

9.47 There are several options for opening up and expanding the '0500' range to other operators:

(a) Numbers in the '0500' range could continue to be used as nine-digit numbers and other codes in the '05XX' range could be allocated to other operators or services in the future, with numbers in these code ranges being either of nine or ten digits.

(b) Current '0500' numbers would be expanded to ten digits by using one of the methods explained for '0800' in paragraphs 9.36 to 9.40 above. ('0500' differs from '0800' in that allocations of numbers have been made from blocks within the '0500' range but some blocks are spare and could be allocated to other operators more easily.)

Freephone numbering range

9.48 Views are also sought on the most appropriate numbering range or ranges for freephone calls, and the possible migration paths for existing services.

9.49 Several options appear to be feasible:

(i) All freephone services would be put together behind a single S-digit. To ensure efficient use of capacity, it might be most appropriate to place these services with other specially tariffed services behind S-digit '8'.

(ii) Freephone services could continue to be split between the '05' and '08' ranges (with full portability between operators) with the market determining which, if either, of the numbers becomes the predominant or exclusive freephone number.

(iii) Freephone services could be provided using 7-digit numbers preceded by the code '0800', provided that suitable transitional arrangements could be made. Capacity in the '0800' ten-digit range may not ultimately be sufficient to satisfy all reasonable requirements in the future. In addition, there may be other considerations which require allocations other than in '0800'.

9.50 OFTEL seeks views on the appropriate numbering range(s) for freephone services.

10 OTHER S-DIGITS

10.1 On the basis of the above proposals S-digits '4', '6' and '9' would not be allocated and remain spare for future allocation.

10.2 It is always prudent when planning a numbering scheme to make provision for an easy migration path to an expanded system, however unlikely or far in the future that might seem. **It is therefore proposed that one S-digit remains available for a possible future expansion beyond 10-digits.**

10.3 Other S-digits should not be allocated at this time, to allow for future allocation for new services or the expansion of existing services as well as for other international or European developments.

11 ACCESS CODES

11.1 An access code is a 3-digit number generally drawn from the local '1XX' range which enables the customer to dial up a service quickly and easily. (On some networks where local-number dialling is not provided, eg on certain mobile networks, 3-digit codes outside the '1XX' range are used - '3XX', '5XX', etc. The use of such codes is not addressed in this document.)

11.2 By agreement, certain codes have been identified as having a common meaning across all PTO networks, eg '100' Operator Service, '112' for emergency, '192' for Directory Enquiries. A full list is at Annex D. Services accessed by these codes are either provided by the individual PTOs within their own networks or are provided by one PTO for another. Within the category of common codes is a particular type, providing gateway access. Gateway access is a means by which a customer using equipment on one particular network can gain access to the services and facilities of another network simply by keying in a 3-digit code which is unique to that second network. Gateway access is currently little developed in the UK, but it is provided by BT on '131' for customer choice of routing via the Mercury network and by Kingston Communications on '13' and '12' for routing calls via Mercury and BT respectively. Some of the remaining access codes are used by the PTOs to provide a range of services entirely within their own networks - typically for customer support and other commercial purposes, eg '150' and '151' on the BT network for sales and fault reporting, or for testing purposes, eg a number of codes are used by engineers at customer premises to access test facilities at local exchanges. Use of these codes is not standardised.

11.3 As the number of licensed operators offering services on the network increases, there will be a continuing need to standardise codes for important and commonly used services. The Telecommunications Numbering and Addressing Body and the Numbering Conventions should provide the means by which the use of these codes can be discussed and promulgated. It is also clear that operators will continue to want to allocate, within their numbering plans, access codes for use only within their own networks.

11.4 One way of promoting competition in routing and in the provision of services is through the use of gateway access codes. OFTEL thinks it is desirable that each operator should have a means by which it can make available its services to customers of other networks. Thus, a BT customer might have access to a Mercury Directory Enquiry service and a cable operator customer would be able to report a fault on his cable system line when calling from a phone on the BT network.

11.5 To achieve this each operator would need to be allocated at least one access code as a gateway from other networks to its services and routing. In view of the shortage of codes and the large number of operators potentially seeking use of such a scheme, however, there may not be sufficient 3-digit codes available.

11.6 It may therefore be necessary to expand the '1XX' range in some way, so that relatively short codes could be made available to a larger number of telecommunications systems operators and service providers. Two methods of expansion have been suggested.

Option A: Four-digit codes

11.7 Under this method of expansion 20 values of '1XX', for example, would be set aside to be expanded to 200 four-digit access codes. This could be done ***either*** by allocating two entire decades of codes such as the '16X' and '17X' ranges ***or*** by selecting 20 unallocated codes throughout the range. Thus, if the code '1611' were allocated to a particular operator, its DQ services might be accessed by '192' on its own network and by dialling '1611 192' from other networks.

Option B: 2 + 3 codes

11.8 As an alternative, two values of '1X' might be expanded in a 2 + 3 format to give 2000 five-digit access codes, leaving the remaining values of '1X' to be used as 3-digit access codes for more frequently used services. '16 123' might be allocated as a gateway code to an operator.

11.9 Under both options, commonly agreed codes like '192' and '112' would be unchanged.

11.10 The increase in number length could also be applied to those access codes used by operators only on their own networks in order to increase the number of available codes for gateway access. It may not be appropriate to extend it to those access codes which are common to all networks, eg '192', '112', etc.

11.11 If capacity allows, however, it may be more appropriate for the major national operators to retain three digit codes, with 4-digit codes allocated only to operators providing local services. OFTEL does not think in general that a wide range of commonly recognised access codes should be available to each operator - the gateway approach uses these scarce numbers more efficiently and is likely to promote easier public recognition of the different services and of different networks offering those services.

11.12 OFTEL does not believe, given the scarcity of this resource, that access codes should be made available to those who do not operate public telecoms networks.

11.13 OFTEL recommends that there should be three types of access codes:

- **(i) common to all networks, eg '192', '100', '112' but allowing access to specific services;**
- **(ii) a block of identified '1XX' codes (20 or 30) to be used by each operator as it sees fit; and**
- **(iii) network identifier codes (one per network) which**

would be recognised by all networks and which allow the user easy access to any network from any phone.

11.14 OFTEL recommends an expansion of the number of digits in access codes be introduced to facilitate (iii), not necessarily for all operators.

11.15 OFTEL seeks views on access codes generally and on these proposals, in particular on:

(i) whether the length of codes should be uniform across all operators or should depend on the nature of the PTO; and

(ii) policy regarding those codes already in use or reserved, eg codes for use only within operators' own networks.

12 SUMMARY

12.1 The document sets out OFTEL's proposals for the development of the UK numbering scheme. These proposals are designed to provide a stable and coherent environment for the 21st century which ensures that sufficient numbering capacity exists for users to have full access to the new and competitive telecommunications services which are emerging.

12.2 The proposals do not involve any modification of the arrangements already announced up to and including the National Code Change in 1995 and are intended to ensure that no further national code changes are required in the foreseeable future.

12.3 The principles which form the basis of OFTEL's proposals are:

(i) The Scheme should be developed in a way that avoids waste of the available capacity.

(ii) The Scheme should be developed in way that ensures its longevity, allowing for technological developments and for further expansion should this ultimately be necessary.

(iii) A clear structure should exist to allow operators, manufacturers and users to plan ahead with confidence.

(iv) The Scheme should be evolutionary not revolutionary.

(v) The development of the Scheme should therefore not inhibit the portability of numbers.

(vi) The Scheme should therefore be developed in a manner which allows for the provision of information on service type and location, as far as practical.

(vii) The numbering scheme should allow innovative use of the numbering range.

12.4 OFTEL's specific recommendations, on which views are sought, concern the following issues:

- the method of expansion of numbers for non-geographic services from 9- to 10-digits; the allocation of codes for non-geographic services to operators, the use of those codes and the allocation of numbers by operators to subscribers **(paragraph 4.13)**;
- the significance of numbering in achieving portability **(paragraph 5.7)**;
- the development of an additional geographic structure behind S-digit '2' **(paragraph 6.24)**;
- the most appropriate means of numbering:
  - ❍ paging services **(paragraph 7.4)**
  - ❍ personal numbering services **(paragraphs 8.7 and 8.8)**
  - ❍ mobile (including cellular and PCN services) **(paragraph 9.17)**
  - ❍ premium-rate services and services providing national calls at local-rate **(paragraph 9.26)**
  - ❍ access codes **(paragraphs 11.12 to 11.15)**;
- for freephone services:
  - ❍ the most appropriate means of introducing ten-digit numbering and the significance of numbering in achieving full portability of freephone numbers **(paragraphs 9.44 and 9.47)**;
  - ❍ the most appropriate numbering range for freephone services **(paragraph 9.49)**.

Annex A

INTERNATIONAL COMPARISON OF NUMBERING SCHEME ARCHITECTURES

A1 Introduction

This annex looks at how three other countries are using their numbering plans to help identify the services called. We have selected three countries with competition in basic services:

- Australia
- the USA which uses the North American Numbering Plan (NANP)
- Japan

Together these countries offer a range of approaches to the use of numbering schemes for service differentiation. In the next three sections we look at each of three individual schemes. Then, in Section A5, we compare and contrast approaches.

A2 Australia

Australia is in the middle of a major redesign of its numbering scheme. With the introduction of competition in basic services and with numbering capacity problems approaching in a number of key areas, Austel, the Australian regulator, has spent the last two years redesigning the Australian numbering plan. After considering a number of options it has now made firm proposals on which there seems to be general consensus. Figure A2.1 shows how the initial digits are used within this new plan to indicate the service called. The main features of the dialling scheme associated with the new plan are as follows:

- rationalisation of the geographical significance of the early digits of PSTN numbers. Australia will in future be divided into four regions. Previously it was divided into 54 areas
- uniform number structure for PSTN numbers. Up to now subscribers have dialled 2+6, 2+7, 3+6 or 4+5 digit format numbers. Under the new plan they will always dial 2+8 digits - with the full 10 digits for national calls and 8 digits for regional or local calls. The digit 0 will continue to be used as long distance calling prefix
- a more rational grouping of similar services under the same leading digits
- widespread use of integrated numbering in which the leading digits for a given service are used by all operators offering that service
- a move to using 00X as a prefix for international calls only. Currently these digits are used by a range of national services (including the PSTN). The code 000 will however remain as the access code to the emergency service
- a move to putting access codes for operator assisted services in the 1XX range in line with European practice. Currently many of these services use the 01X range of access codes
- use of the 1XX dialling space for major commercial services like freephone, audiotex and UPT as well as for operator assisted services and non-commercial information services
- reservation of significant areas of the numbering space for future use. The main numbering space consists of 20 blocks each with a capacity of up to 100 million numbers. Four of these are reserved for future use and one for expansion of the numbering scheme. In many of the 15 other blocks only one or two ranges of 10 million numbers are currently open.

Figure 2.1 Use of dialling space of future Australian numbering plan

Initial digits dialled	*Main uses*	*Example*
00	Emergency code	000
	International prefix	(001XX)+CC+NSN
	International prefix	(006)+CC+NSN
01	Paging	(0)+16+6 digit SN
	Analogue cellular	(0)+18+6 digit SN
02	PSTN numbers for Central/Eastern region	(0)+2+8 digit LN
03	PSTN numbers for South Eastern region	(0)+3+8 digit LN
04	Digital mobile telephony	(0)+41+7digit SN
05	Reserved for expansion to 11 digits	
06	Reserved - use to be decided	
07	PSTN numbers for North Eastern region	(0)+7+8 digit LN
08	PSTN numbers for Central/West region	(0)+8+8 digit LN
09	Reserved - use to be decided	
10	Interim access to Optus services	(10)+NSN or LN
11	Non commercial short codes eg weather, community services	11XXX
12	Operator services eg DQ, operator call collect	12XX
13	Short premium numbers for commercial use	131XXX
14	Carrier preselection override	14XX
15 & 16	Reserved - use to be decided	
17	UPT	17+8 digit SN
18	Freephone	180+7 digit SN
	Charge card	181+>0 digits
	VPN	188+3 to 7 digit SN
19	Audiotex PRS	190+7 digit SN
	Enhanced for service	197+7 digit SN
2X to 9X	Local dialling to PSTN subscribers	2XXX XXXX to 9XXX XXXX

Key:
NSN = National Significant Number
SN = Service Number
LN = Local Number
CC = Country Code
X = 0 to 9
() = indicates a prefix

Source: Australian Telephone Numbering Plan - What your number will change to - Austel 10/92

A3 The USA

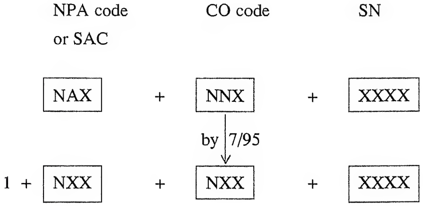
The USA with Canada and the Caribbean uses the North American Numbering Plan (NANP). Figure A3.1 shows the basic structure of the current plan. The full number has three components:

- the NPA or Numbering Plan Area code. An NPA code is equivalent to at NNG in the UK
- the CO or Central Office code. This is equivalent to the local exchange code in the UK
- the station number (equivalent to the subscriber number in the UK)

Subscribers call within an NPA by dialling the seven digits of the Central Office (CO) code and Station Number. Subscribers calling other NPAs dial the full 10 digit number. The network distinguishes between NPA and CO codes by examining the second digit dialled. This is 0 or 1 for NPA codes and 2 through 9 for CO codes. A trunk prefix is therefore not required.

The NANP is close to exhaustion. To increase capacity the NANP will, from the mid 1990s, use the prefix 1 for automatic long distance dialling. This will enable NPA and CO codes to be used interchangeably - with the second digit of both code types taking any value between 0 and 9. This will, for example, increase the supply of NPA codes from 152 to 792.

Figure 3.1 The current and future structure of the NANP



Key:
N = 2 to 9
A = 0 or 1
X = 0 to 9

NPA = Numbering plan area
SAC = Service access code
SN = Station number or Subscriber number (UK equivalent)
CO = Central Office

With this change in mind the NANP Administrator has carried out extensive study and consultation to decide how best to use the additional capacity. At the beginning of 1992 the Administrator issued a proposal for the future of the NANP. Consultation on the document is now complete and results of the consultation are due for publication early in 1993. Based on the proposals of January 1992 and informal discussion on the likely form of NANP following the consultation, Figures A3.2 and A3.3 specify how the dialling space of the NANP is likely to be used from mid 1995.

Figure A3.2 Use of dialling space of the future NANP

Initial digits dialled	*Main uses*	*Example*
00	Connection to LEC operator	0
	Connection to LEC operator	00
01	IDD	(011)+CC+NSN
	Manually connected international calls	(01)+CC+NSN
02 to09	Manually connected national calls *see Figure A3.3 for more details*	(0)+NSN
10	Carrier selection using Feature Group D	(10XXX)+(1)+NSN
11	Vertical service code prefix eg for call forwarding	(11XX)+(1)+NSN
12 to 19	Automatically connected national calls *See Figure A3.3 for more details*	(1)+NSN
2X to 9X	Used for local number dialling except for:	LN
	DQ	411
	Repair service	611
	Access to local office	811
	Emergency services	911

Key: NSN = National Significant Number
SN = Service Number
LN = Local Number
CC = Country Code
X = 0 to 9
LEC = Local exchange carrier
IEC = Inter exchange carrier
() = indicates a prefix

Source: BOC notes on the LEC Networks - Section 3 1990

The main features of new scheme are as follows:

- initial digits 0 and 1 are used in various combinations as trunk, international and carrier selection prefixes, and for connection to the operator
- the NANP uses and will continue to use the non-standard prefix 011 for international direct dialling (IDD)
- there are two trunk prefixes - 0 and 1. The prefix 1 is used for direct dialling of national calls; the prefix 0 is used when subscribers dial national calls with operator assistance
- as in the Australian plan there is widespread use of integrated numbering in which the leading digits for a given service are used by all operators offering that service
- NPA codes of the form N00 are used as service access codes and do not have geographical significance
- codes of the form N11 are reserved as short number service codes
- the remaining NPA codes are allocated according to the value of the second digit
- codes of the form N0X and N1X are currently used for geographical based services. (In North America these include mobile, paging and premium rate services as well as the PSTN)
- in future it is likely that the new N2X and N3X codes will also be used for geographically based services, whilst the N8X and the N9X codes will be allocated for non-geographical service use
- codes N4X, N5X, N6X and N7X will be reserved for future expansion. If further numbering space is needed for geographical services then NPAs from the N4X range will be allocated first, if more space is required for non-geographical services then NPA codes from the N7X range will be allocated first. In addition a set of 80 NPA codes will be kept in reserve for long term expansion of the NANP from a 10-digit to an 11-digit scheme.

Figure A3.3 Future use of NPA codes in the NANP

N00 codes

200	Unallocated
300	Unallocated
400	Unallocated
500	Personal communications services (PCN in UK)
600	Non geographical services in Canada
700	Carrier specific services
800	Freephone
900	Information services

N11 codes

211	Unallocated
311	Unallocated
411	DQ short code
511	Unallocated
611	Repair service short code
711	Unallocated
811	Local business office short code
911	Emergency services short code

Other NPA codes

N0X N1X N2X N3X	For geographic based services - mainly PSTN but also paging, cellular mobile, premium rate
N4X N5X N6X N7X	Reserved for both geographic and non geographic services Also one set of 80 NPA codes reserved for expansion of NANP to 11 digits
N8X N9X	For non geographic services eg mobile, satellite, UPT

Key:
NANP = North American Numbering Plan
NPA = Numbering Plan Area
N = 2 to 9
X = 0 to 9

Source: Bellcore letter of 6/1/92 on future of NANP
Discussions with NANP Administrator

A4 Japan

The Japanese numbering plan was modified through the 1980s to enable the introduction of a series of new common carriers (NCCs) to compete with the incumbents - NTT for national services and KDD for international services. These NCCs include:

- three national NCCs (Teleway Japan, DDI and Japan Telecom)
- two international NCCs (IDC and IDJ)
- a small number of local NCCs
- several hundred radio based carriers offering voice and/or paging services.

Like the Australian and North American numbering plans, the Japanese numbering plan allows local dialling. The trunk prefix 0 is used. The numbering formats vary from 2+8 digits for Tokyo and Osaka to 6+4 digits for small towns. The digits 0 and 1 are not allowed as the initial digits of local numbers.

Figure A4.1 shows how the dialling space of the Japanese scheme is currently used. The information presented is based upon a series of discussions with representatives of NTT and the Ministry of Posts and Telecommunications.

Several features of the current scheme are worth noting:

- the 00 range is used to create prefixes for the selection of national NCCs as well as providing prefixes for international direct dialling via KDD and the international NCCs
- NTTs freephone and premium rate information service access codes are embedded within the range used for the PSTN
- the freephone service of the national NCCs is accessed in a different way from that of NTT. Someone calling NTTs freephone service dials 0120 + Service Number. Someone dialling an NCC freephone service would dial the relevant carrier selection code, a two digit access code, and the service number
- the dialling space of the form 0X0 is not used by the PSTN. Most is reserved for non geographical services (but some is currently used by NTT for

Figure A4.1 Use of dialling space of Japanese numbering plan

Initial digits dialled	*Main uses*	*Example*
00	International prefix - KDD	(001X)+CC+NSN
	International prefix - ITJ	(004X)+CC+NSN
	International prefix - IDC	(006X)+CC+NSN
	Prefix to select national NCC	(0070)+0+NSN for TWJ (0077)+0+NSN for DDI (0088)+0+NSN for JT
01	National PSTN calls eg Sapporo	(0)+11+LN
	Freephone	(0)+120+SN
	DQ	0190
	Access to PSPDN	010
02	National PSTN calls eg Sendai	(0)+22+LN
03	National PSTN calls eg Tokyo	(0)+3+LN
	Cellular mobile	(0)+30+SN
04	National PSTN calls eg Kawasaki	(0)+44+LN
	Cellular mobile	(0)+40+SN
05	National PSTN calls eg Nagoya	(0)+52+LN
06	National PSTN calls eg Osaka	(0)+6+LN
	Access to PSPDN	060
07	National PSTN calls eg Kyoto	(0)+75+LN
08	National PSTN calls eg Hiroshima	(0)+82+LN
09	National PSTN calls eg Nagasaki	(0)+958+LN
	NTT premium rate information services	(0)+99+SN
10	Operator services	104 for DQ 100 for operator
11	Other public services	119 for fire/ ambulance 113 for fault repair
12	Credit card, voice conferencing	
14	Supplementary services prefixes eg call forwarding	(142)+NSN
16	Videotex, for store and forward access	
17	Public information services	177 for weather
18	Supplementary services prefixes	
19	Used for local call dialling	
2X to 9X		

Key: NSN = National Significant Number; SN = Service Number; LN = Local Number; CC = Country Code; X = 0 to 9; ( ) = indicates a prefix

Source: Discussions with NTT and MPT

internal purposes). To date however only the codes 030 and 040 have been used for commercial E164 numbered services.

A5 Comparing the three schemes

In this final section we compare the three schemes discussed above by examining how each of them deals with four issues.

5.1 How does each scheme distinguish geographical and non-geographical services?

All three schemes allow local dialling of geographically based services. There are therefore two cases to consider:

- distinguishing between geographical service numbers which use local dialling and other numbers
- distinguishing between geographical service numbers which use full national dialling and other numbers.

Geographical service numbers using local dialling v other numbers

In all the three schemes dialling a 2, 3, 4, 5, 6, 7, 8 or 9 as the first digit indicates that the user is calling a local geographically based service. Calls starting with a 0 or 1 indicate a long distance geographical call, a call to a non-geographical service or a short service code or special selection prefix.

Geographical service numbers using full national dialling v other numbers

Here the approach to distinguishing geographical and non-geographical service varies by country:

- in Australia full national numbers of geographical services are distinguished from non-geographical numbers by the first digit of the nationally significant number. A value of 2, 3, 7 or 8 indicates a geographically structured number
- in the USA the second digit of the nationally significant number is used. The value of 0, 1, 2, or 3 for the second digit indicates a call to a geographically based service (except for numbers beginning N00 or N11)

- in Japan the distinction is more difficult to make. It should be possible to number most non-geographical services so that the second digit of the nationally significant number is 0. But NTT's freephone and premium rate information services currently break the rule.

A5.2 What are the service access codes for the main geographical services?

Figure A5.1 shows the service access codes for freephone, premium rate services and mobile services in the three countries studied. There is no pattern. But what the figure does show is that, whilst Japan and North American always use the trunk prefix for national access to non-geographical services, Australia does not. For example cellular mobile services in Australia use a trunk prefix but freephone and premium rate services do not. This lack of standard dialling procedures could lead to confusion, especially if subscribers are dialling internationally accessible services from overseas.

A5.3 How much capacity has been allocated to geographical and non-geographical services?

Figure A5.2 makes crude estimates of the numbering capacity available for geographical and non-geographical services and the capacity which will be reserved for future use. (Numbering space reserved for expansion of number length is not included here). We have not attempted to make estimate for Japan because of lack of adequate information. It is interesting to note how the proportion of capacity allocated to geographical and non geographical services differs between the NANP and the Australian numbering plan.

A5.4 Where are short service codes located within the dialling space?

Short service codes, which enable users to contact the operator, directory enquiries and fault reporting centres, or to access public information services like weather and time, take up a substantial proportion of the space within a country's dialling scheme. The three countries studied take different approaches to these codes:

- Australia is rationalising its short code service codes and moving them all into the 11XX and 12XX ranges (except from the emergency code 000)
- the USA uses a limited number of such codes of the form N11
- in Japan short service codes are scattered throughout the 1XX range of the dialling space.

Figure A5.1 Service Access Codes for main non geographical services

	Australia	*USA*	*Japan*	
Freephone	180+SN	(1)+800+SN	(0)+120+SN	NTT
			(00XX)+AB+SN	NCCs
Premium rate information services	190+SN	(1)+900+SN	(0)+99+SN	NTT
Cellular mobile	(0)+18+SN-analogue	(1)+500+SN	(0)+30+SN	All carriers
	(0)+41+SN-digital	(1)+Geographical NSN	(0)+40+SN	All carriers

Key: SN = Service number
NSN = Nationally significant number

Figure A5.2 Numbering capacity allocated to different services

Service type	*Australia*	*North America*	*Japan*
Geographical numbers (millions)	400	3200	§
Non geographical numbers (millions)	600	1600	§
Reserved and usable numbers (millions)	300	2400	§
Population (millions)	18	300	120
Geographical numbers per head	22	11	§
Non geographical numbers per head	33	5	§
Reserved and usable numbers per head	17	8	§

§ Not enough information available to estimate

Annex B

OFTEL'S PROPOSALS FOR THE UK NUMBERING SCHEME

S-Digit

1	geographic PSTN; some paging services
2	new geographic scheme
3	mobile: cellular, PCN; radio-based paging
4	unallocated
5	possibly freephone
6	unallocated
7	personal numbering
8	premium rate, national calls charged at local rate; possibly freephone
9	unallocated
0	international access (00 code)

Evolution of the UK numbering scheme under OFTEL's proposals

Service	*Current allocations*	*At National Code Change*	*Recommendations for 10-digit numbering*
Geographic PSTN	0ABC	01ABC	
Paging services	0ABC	either 01ABC or 0ABC	bureaux 01ABC direct-dial 03ABC
Mobile services			
(i) *Cellular*	0374	0374	0374 (+ later digit)
	0385	0385	0385 (+ later digit)
	0802	0802	03802
	0831	0831	03831
	0836	0836	03836
(ii) *PCN*	0956	0956	03956
	0958	0958	03958
	0973	0941	03941
	0976	0976	03976
Specially tariffed services			
(i) *premium rate*	0336	0336	08336
	0338	0338	08338
	0640	0640	08640
	0660	0660	08660
	0839	0839	0839 (+ later digit)
	0881	0881	0881 (+ later digit)
	0891	0891	0891 (+ later digit)
	0898	0898	0898 (+ later digit)
(ii) *national calls at local rate*	0345	0345	08345
	0645	0645	08645
(iii) *freephone*	0500	0500	to be decided
	0800	0800	

Annex C

NOP CONSUMER MARKET RESEARCH CARRIED OUT FOR OFTEL ON TELEPHONE NUMBERS

NOP Consumer Market Research carried out a survey of adults aged 15 years and over between 10-15 March 1993. In total 1880 interviews took place.

(a) Telephone numbers as service indicators

77% of people thought that it was either quite important or very important that you should be able to recognise the type of service being called from the number prefix.

(b) Telephone numbers as tariff indicators

84% of people thought that it was either quite important or very important that you should be able to know the cost of calling a particular number from its prefix.

(c) Recognition of 0800 freephone services

0800 was the non-geographic service code which was most recognised - 68% of those questioned recognised the code and 84% of those recognising it correctly identified it as a freephone number.

Annex D

ACCESS CODES

Common codes in use

100	Operator assistance
112	Emergency
153	International Directory Enquiries
192	National Directory Enquiries
999	Emergency Operator